EMC TEST REPORT

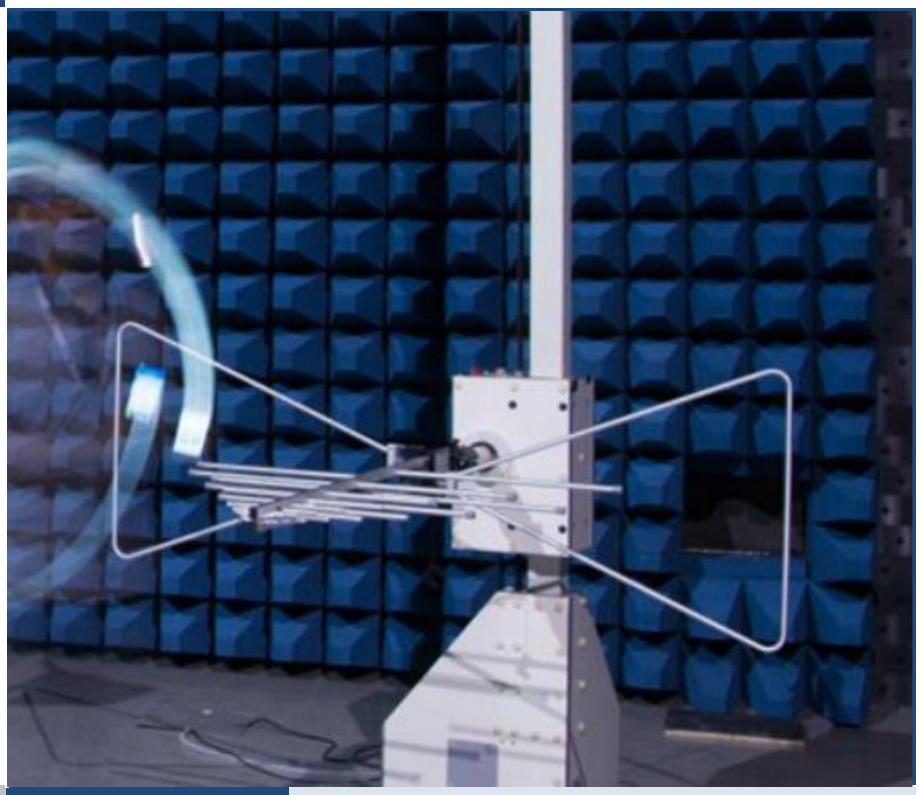
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Roller Shade Driver E1

ISSUED TO
Konec Solutions Pty Ltd.

Level 3, 5 Talavera Rd, Macquarie Park NSW 2113 Australia



Tested by: Xiong Chong
Xiong Chong
Date Mar. 09, 2022

Approved by:
Liao Jianming
(Technical Director)
Date Mar. 09, 2022

Report No.:	BL-SZ21C0869-401
EUT Name:	Roller Shade Driver E1
Model Name:	RSD-M01
Brand Name:	Aqara
Test Standard:	AS/NZS CISPR 32: 2015+AMD1:2020
Test Conclusion:	Pass
Test Date:	Dec. 23, 2021 ~ Dec. 27, 2021
Date of Issue:	Mar. 09, 2022

Block B, 1st FL,Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Mar. 09, 2022	Initial Issue

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C to 25°C
Ambient Relative Humidity	30% to 60%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v4.1.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Konec Solutions Pty Ltd
Address	Level 3, 5 Talavera Rd, Macquarie Park NSW 2113 Australia

2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd.
Address	8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	Guangdong A-OK Technology Grand Development Co., Ltd.
Address	Hexing Road South Side, Sanhe Economic Development Zone, Huiyang, 516213 Huizhou, Guangdong, PEOPLE'S REPUBLIC OF CHINA.

2.4 General Description for Equipment under Test (EUT)

EUT Name	Roller Shade Driver E1
Model Name Under Test	RSD-M01
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	KC131-01 V1.1
Software Version	210115c V1.3
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	GLIDA-INP523450-2S1P
	Serial No.	N/A
	Capacity	1000 mAh
	Rated Voltage	7.4 V
	Limit Charge Voltage	8.4 V
Ancillary Equipment 3	TYPE-C Cable	
	Model No.	N/A
	Length (Approx.)	2.0 m

2.6 Technical Information

Network and Wireless connectivity		ZigBee
Interfaces present on the EUT	AC Ports	From mains to AC power adapter.
	DC Ports	From power supply to EUT, the DC port cable length is less than 3m.
	I/O Ports	USB, which cable length is less than 3m.
	Telecom Ports	No Tel ports.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	AS/NZS CISPR 32: 2015+AMD1:2020	Electromagnetic compatibility of multimedia equipment — Emission requirements

3.2 Verdict

No.	Base Standard	Description		Test Verdict	Result	Remark
Emission						
1	CISPR 32	Radiated Emission	Below 1 GHz	Pass	ANNEX A.1	--
			Above 1 GHz	Pass		Note 1
2	CISPR 32	Conducted Emission	Mains terminals	Pass	ANNEX A.2	--
			Asymmetric mode	N/A	ANNEX A.3	Note 2
			Differential voltage	N/A	ANNEX A.4	Note 3
Note 1: The highest frequency of the internal sources of the EUT is above 108 MHz, the measurement shall be made above 1 GHz. Note 2: For cables longer than 3 m only. Note 3: For Class B broadcasting receiver only.						

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	2.96 dB
Radiated emissions (30 MHz-1 GHz)	3.67 dB
Radiated emissions (1 GHz-18 GHz)	3.57 dB
Radiated emissions (18 GHz-40 GHz)	5.16 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	20°C to 25°C	USB 5V or from battery	30% to 60%	100 kPa to 102 kPa

4.2 Test Equipment

Radiated Emission Test For Frequency Below 1 GHz (10 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.06.01	2022.05.31	☐
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-0883	2020.05.11	2022.05.10	☐
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2021.08.15	2024.08.14	☐

Radiated Emission Test For Frequency Below 1 GHz (3 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2021.09.13	2022.09.12	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19	☒
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2020.03.16	2023.03.15	☒

Radiated Emission Test For Frequency Above 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2021.09.13	2022.09.12	☒
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1917	2019.07.02	2022.07.01	☒
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2020.03.16	2023.03.15	☒

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY571103039	2021.06.01	2022.05.31	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.08	2022.06.07	☒
ISN	TESEQ	ISN T800	34449	2021.11.24	2022.11.23	☐
ISN	TESEQ	ISN T8-CAT6	53561	2021.06.01	2022.05.31	☐
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2021.08.14	2024.08.13	☒

4.3 Test Enclosure list

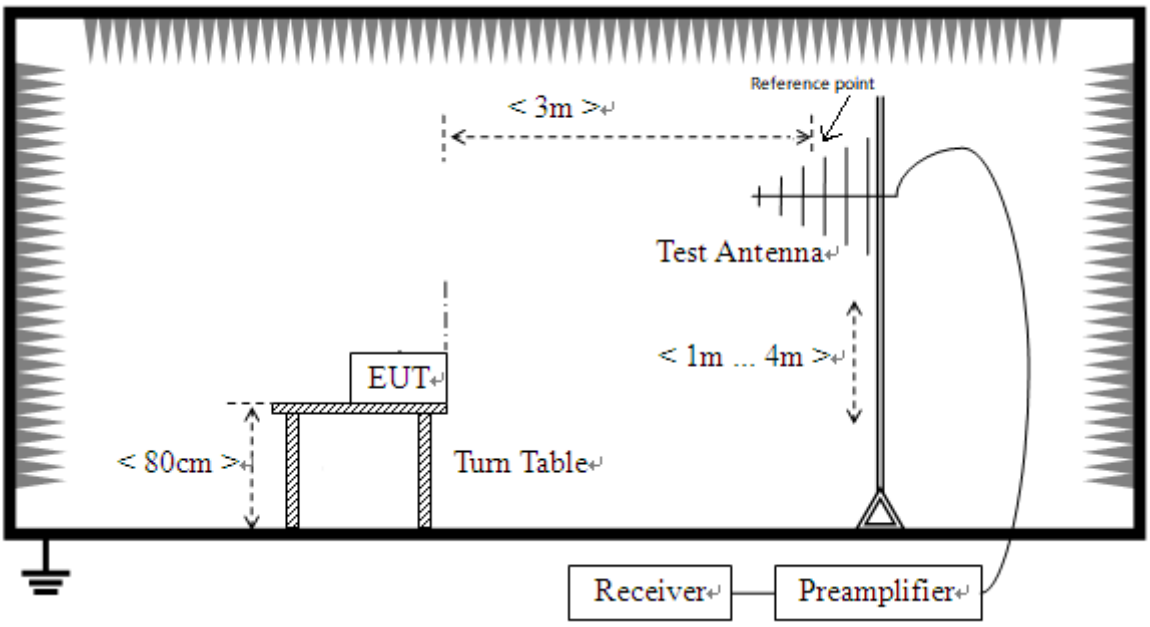
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Adapter	OPPO	AK903HK	N/A	N/A	N/A	☒

4.4 Test Configurations

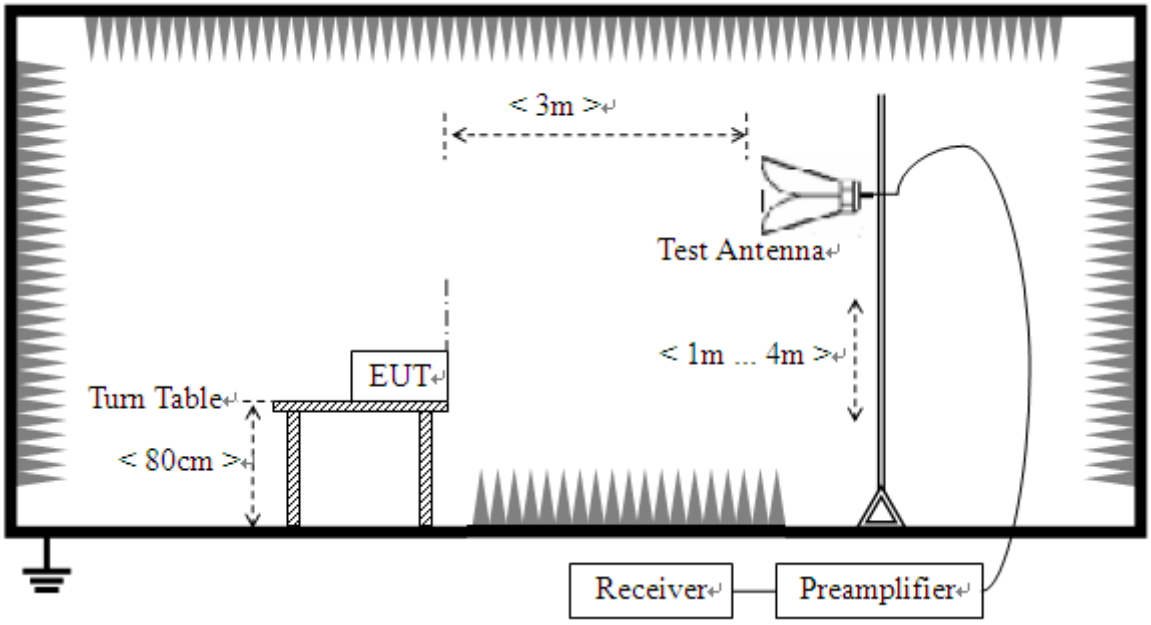
Test Configurations (TC) No.	Description
TC01	The Working Test Mode EUT + Adapter + TYPE-C Cable + Battery

4.5 Test Setups

Test Setup 1

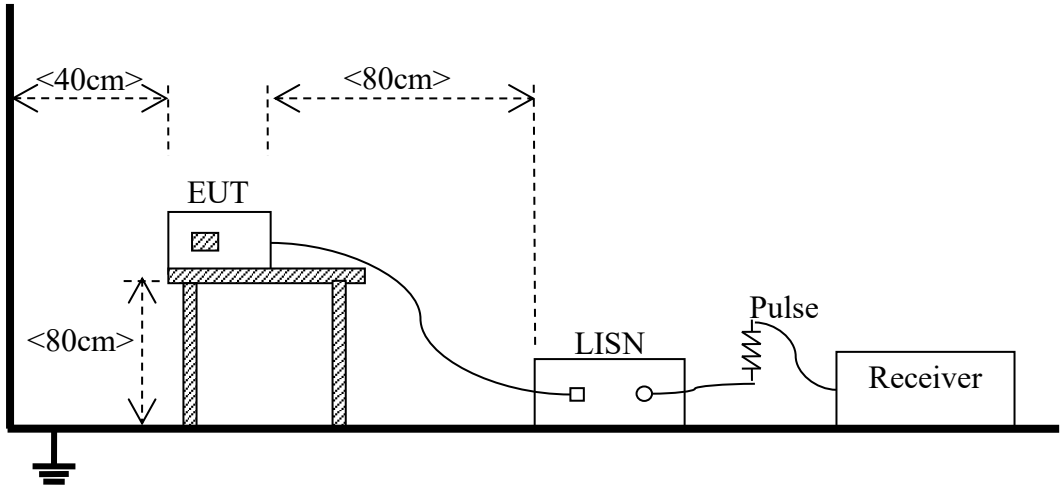


(For Radiated Emission Test (30 MHz-1 GHz))



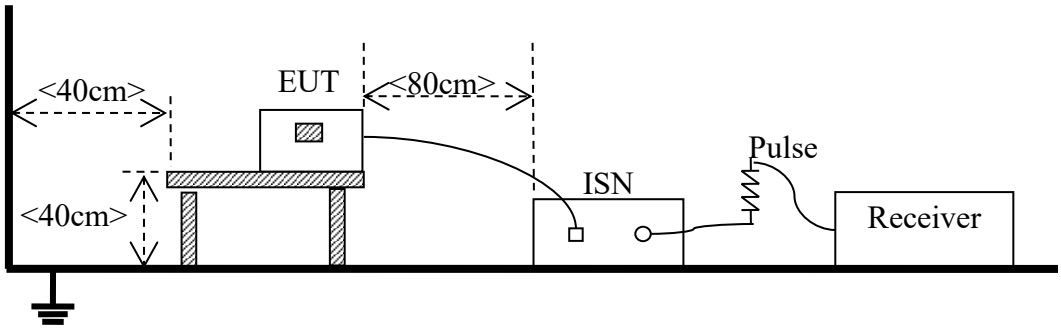
(For Radiated Emission Test (above 1 GHz))

Test Setup 2



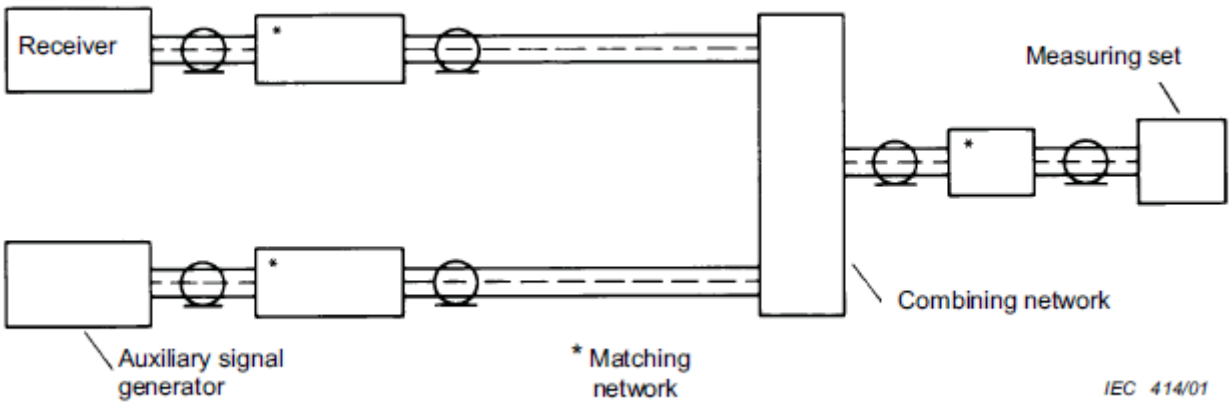
(For Conducted disturbance voltage at mains terminals Test)

Test Setup 3



(For Conducted disturbance for asymmetric mode Test)

Test Setup 4



(For Conducted differential voltage emission (TV/FM broadcast receiver tuner ports))

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Env.	NTNV
	Test Setup	Test Setup 1
	Test Configuration	TC01 Note
Conducted disturbance voltage at mains terminals	Test Env.	NTNV
	Test Setup	Test Setup 2
	Test Configuration	TC01 Note
Note: Based on client request, all normal using modes of the normal function were tested, but only the worst test data of test mode is reported in this report. The Working Test Mode is the worst mode in this report.		

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class A (at 3 m)	Class B (at 3 m)
	Quasi-Peak Limit (dBμV/m)	Quasi-Peak Limit (dBμV/m)
30 - 230	50	40
230 - 1000	57	77

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement		Quasi-Peak Limit (dBμV/m) Fundamental	Quasi-Peak Limit (dBμV/m) Harmonics	Quasi-Peak Limit (dBμV/m) Other
	Facility	Distance (m)			
30-230	OATS/SAC	10	50	42	30
230-300				42	37
300-1000				46	37
30-230	OATS/SAC	3	60	52	40
230-300				52	47
300-1000				56	47

NOTE:

1) The lower limit shall apply at the transition frequency.
2) Additional provisions may be required for cases where interference occurs.

5.1.1.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Conducted disturbance voltage at mains terminals

5.1.2.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 2. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Conducted disturbance for asymmetric mode

5.1.3.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dBμV)	Average (dBμV)	Quasi-peak (dBμV)	Average (dBμV)
0.15 - 0.50	97-87	84-74	84-74	74-64
0.50 - 30	87	74	74	64

NOTE:

1) The lower limit shall apply at the band edges.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.3.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 3. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Measurement of common mode (asymmetric mode) current or voltage emissions at wired network ports for attachment of unscreened balanced pairs shall be performed with the wired network port connected by a cable to an AAN. The AAN shall define the common mode termination impedance seen by the wired network port during the emission measurements.

The voltage division factor shall be added to the measured voltage measured by the receiver directly at the voltage measurement port of the AAN and the result compared with the voltage limits as applicable.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Conducted differential voltage emission

5.1.4.1 Test Limit

Applicability	Frequency range (MHz)	Differential voltage limit @75Ω(dBuV)		
		Local Oscillator Fundamental	Local Oscillator Harmonics	Other
Television receivers; video recorders; PC TV broadcast receiver tuner cards; Digital audio receivers	30 to 950	46	46	46
	950 to 2150	54	54	46
Tuner units (not the LNB) for satellite signal reception	950 to 2150	54	54	46
FM audio receivers and PC tuner cards	30 to 300	54	50	46
	300 to 1000	54	52	46
FM car radios	30 to 300	66	59	46
	300 to 1000	66	52	46
RF modulator output ports connect to TV broadcast receiver tuner ports	30 to 950	76	46	46
	950 to 2150	N/A	54	46

5.1.4.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

1. The impedance as seen from the TV/FM broadcast receiver tuner port of the EUT shall be equal to the nominal antenna input impedance for which the port has been designed. The EUT shall be tuned to the wanted signal from the AE (signal generator). The emission level shall be measured across the relevant frequency range taking into account the attenuation between the EUT TV/FM broadcast receiver tuner port and the measurement device.

2. The RF modulator output port of the EUT is connected to the input of the measuring device by means of a coaxial cable and a matching network (if necessary). The characteristic impedance of the cable shall be equal to the nominal output impedance of the EUT. The EUT shall produce an RF carrier modulated by a video signal defined. The RF output level shall be obtained by adding the insertion loss of the matching network to the indication of the measuring device (tuned to the video carrier frequency and its harmonics).

5.1.4.4 Test Result

Please refer to ANNEX A.4.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of "--" in the table which means not application.

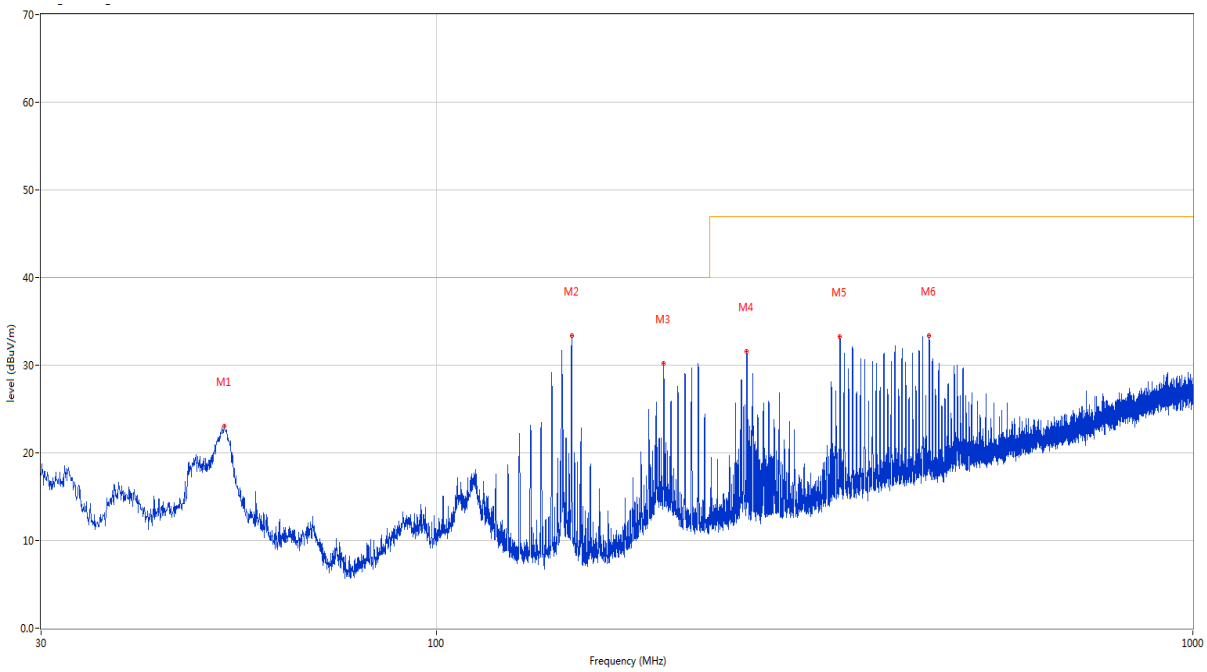
Note 2: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz.

To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

Test Data and Plots (Below 1 GHz)

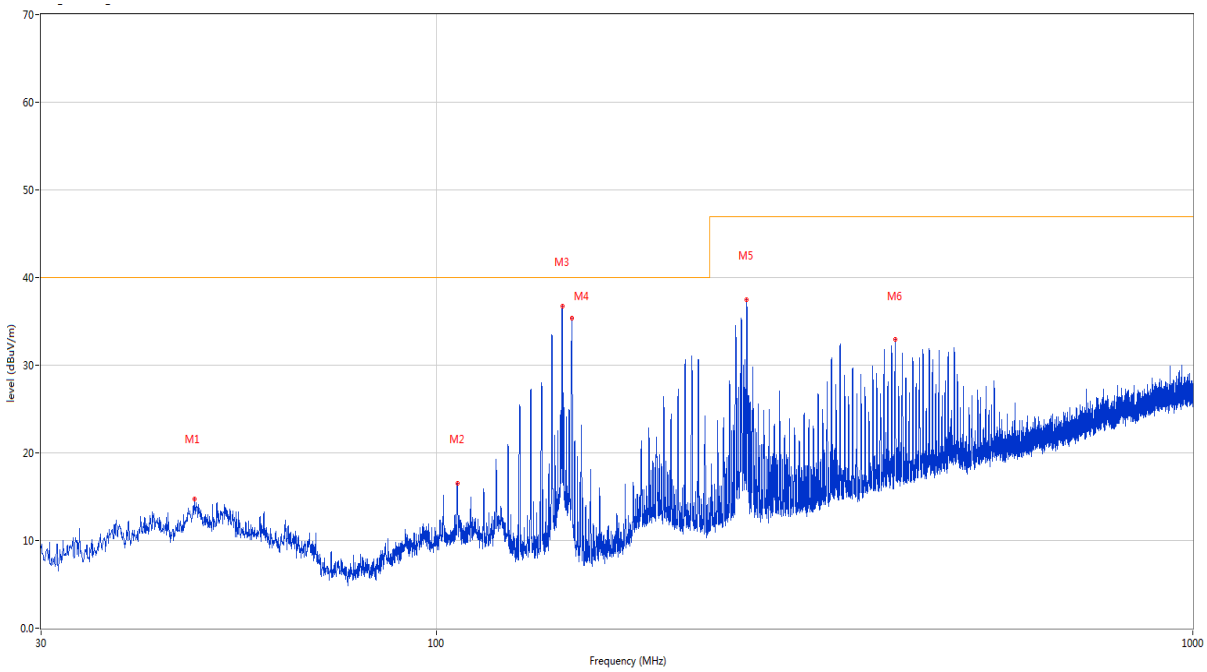
The Working Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.407	23.03	-23.10	40.0	-16.97	Peak	213.60	100	Vertical	Pass
2	150.911	33.38	-28.17	40.0	-6.62	Peak	119.70	100	Vertical	Pass
3	199.702	30.25	-24.11	40.0	-9.75	Peak	226.80	100	Vertical	Pass
4	257.271	31.56	-22.74	47.0	-15.44	Peak	86.40	100	Vertical	Pass
5	341.612	33.27	-19.95	47.0	-13.73	Peak	253.20	200	Vertical	Pass
6	448.118	33.42	-17.62	47.0	-13.58	Peak	111.40	100	Vertical	Pass

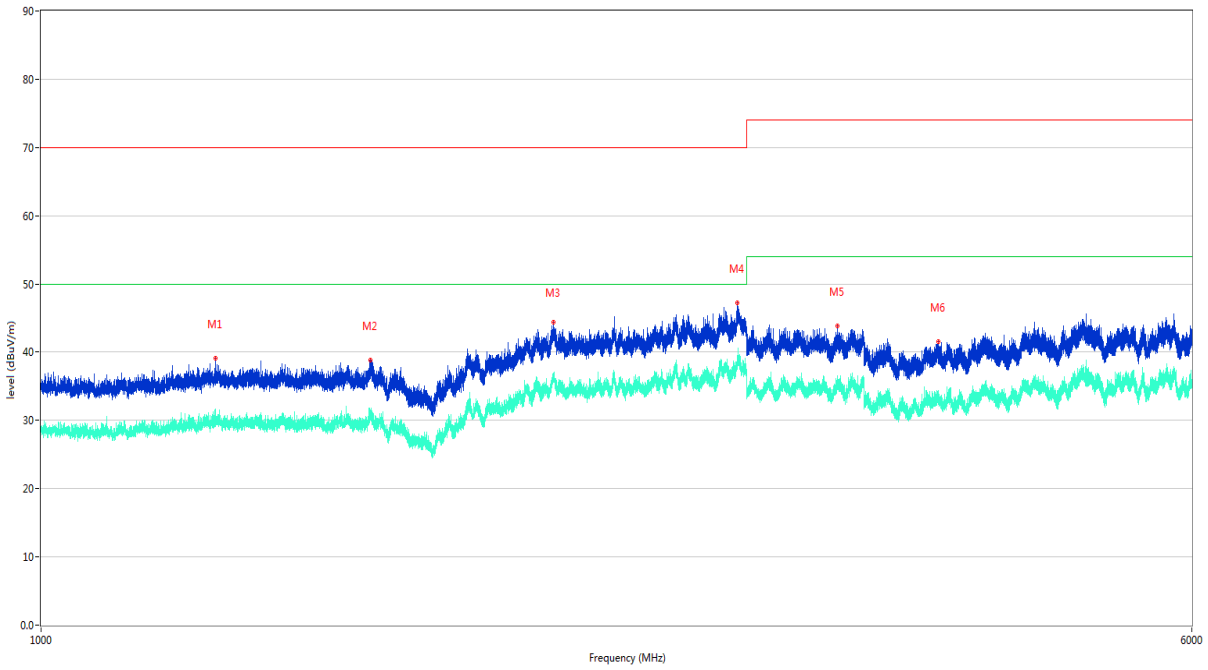
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.897	14.71	-22.66	40.0	-25.29	Peak	360.00	200	Horizontal	Pass
2	106.581	16.49	-24.11	40.0	-23.51	Peak	360.00	200	Horizontal	Pass
3	146.642	36.75	-27.62	40.0	-3.25	Peak	35.20	200	Horizontal	Pass
4	151.056	35.33	-28.16	40.0	-4.67	Peak	360.00	200	Horizontal	Pass
5	257.271	37.45	-22.74	47.0	-9.55	Peak	196.80	100	Horizontal	Pass
6	404.032	32.90	-19.04	47.0	-14.10	Peak	165.60	200	Horizontal	Pass

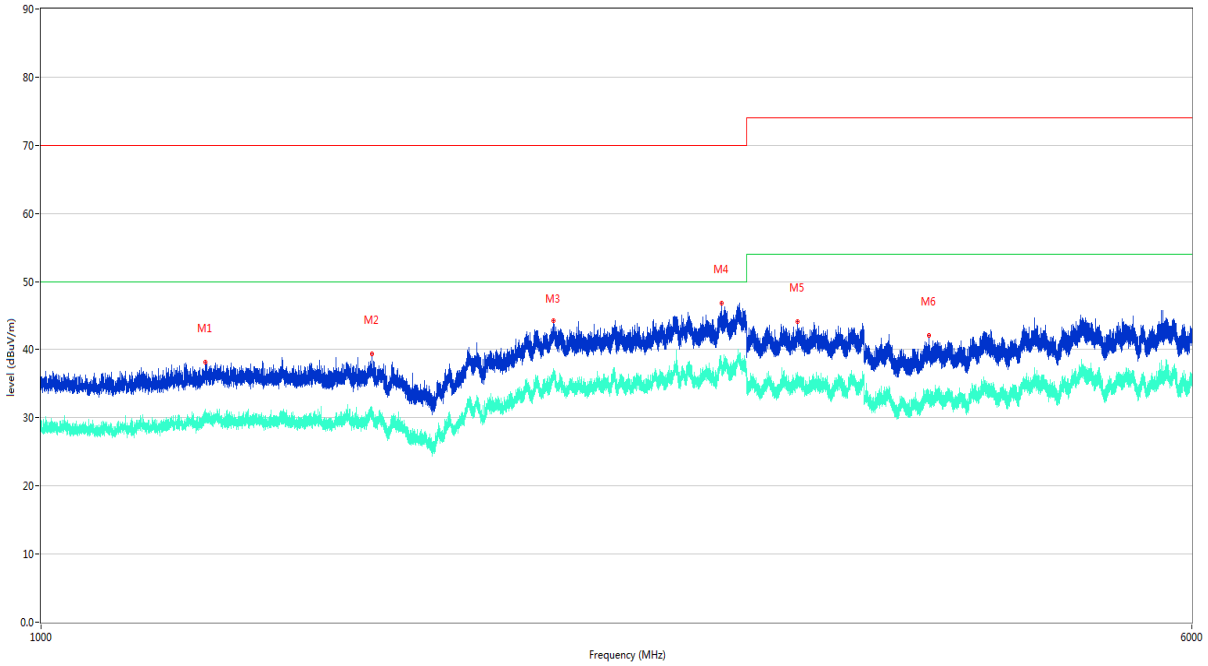
Test Data and Plots (Above 1 GHz)

A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1312.000	39.12	-14.93	70.0	-30.88	Peak	1.80	100	Vertical	Pass
1**	1312.000	30.06	-14.93	50.0	-19.94	AV	1.80	100	Vertical	Pass
2	1669.100	38.90	-14.04	70.0	-31.10	Peak	258.00	100	Vertical	Pass
2**	1669.100	30.35	-14.04	50.0	-19.65	AV	258.00	100	Vertical	Pass
3	2220.600	44.37	-8.39	70.0	-25.63	Peak	360.00	100	Vertical	Pass
3**	2220.600	36.99	-8.39	50.0	-13.01	AV	360.00	100	Vertical	Pass
4	2957.700	47.27	-4.74	70.0	-22.73	Peak	286.40	100	Vertical	Pass
4**	2957.700	38.67	-4.74	50.0	-11.33	AV	286.40	100	Vertical	Pass
5	3455.250	43.80	-7.53	74.0	-30.20	Peak	254.30	100	Vertical	Pass
5**	3455.250	34.52	-7.53	54.0	-19.48	AV	254.30	100	Vertical	Pass
6	4043.850	41.59	-6.08	74.0	-32.41	Peak	162.50	100	Vertical	Pass
6**	4043.850	34.23	-6.08	54.0	-19.77	AV	162.50	100	Vertical	Pass

A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



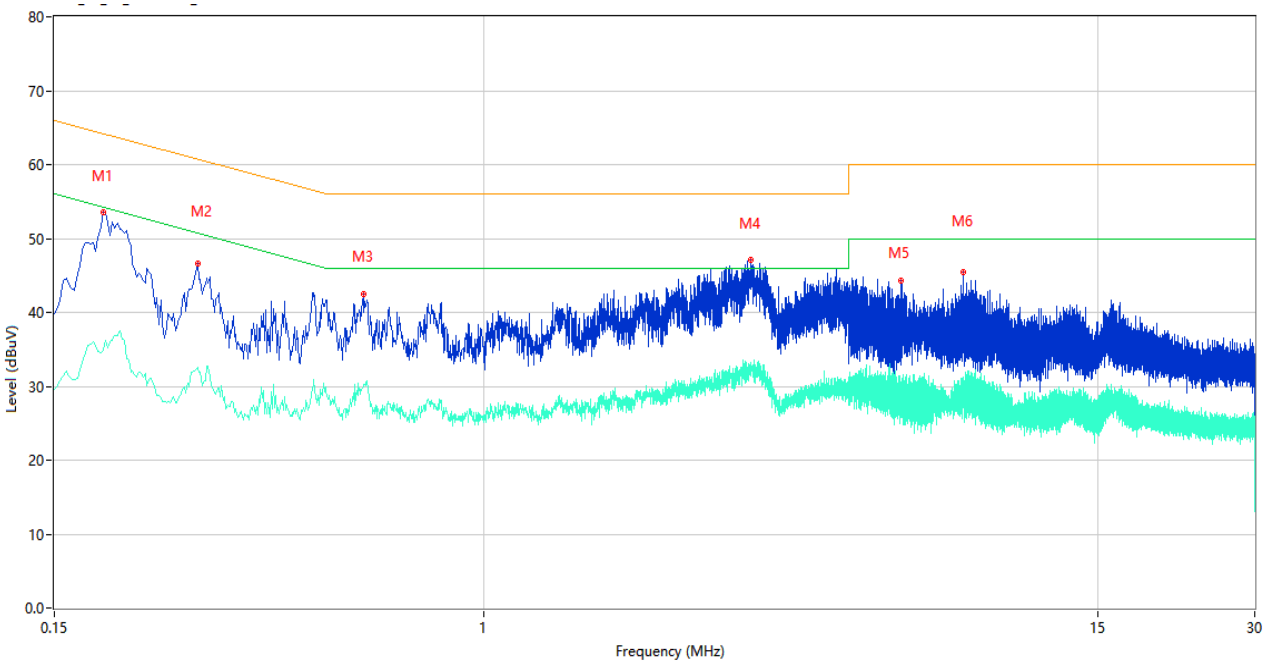
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1292.000	38.12	-14.94	70.0	-31.88	Peak	335.00	100	Horizontal	Pass
1**	1292.000	29.90	-14.94	50.0	-20.10	AV	335.00	100	Horizontal	Pass
2	1673.800	39.36	-14.15	70.0	-30.64	Peak	360.00	100	Horizontal	Pass
2**	1673.800	30.52	-14.15	50.0	-19.48	AV	360.00	100	Horizontal	Pass
3	2221.000	44.30	-8.35	70.0	-25.70	Peak	17.60	100	Horizontal	Pass
3**	2221.000	36.36	-8.35	50.0	-13.64	AV	17.60	100	Horizontal	Pass
4	2883.800	46.89	-6.19	70.0	-23.11	Peak	297.80	100	Horizontal	Pass
4**	2883.800	37.16	-6.19	50.0	-12.84	AV	297.80	100	Horizontal	Pass
5	3247.950	44.15	-7.68	74.0	-29.85	Peak	327.80	100	Horizontal	Pass
5**	3247.950	35.17	-7.68	54.0	-18.83	AV	327.80	100	Horizontal	Pass
6	3986.850	42.09	-6.06	74.0	-31.91	Peak	180.80	100	Horizontal	Pass
6**	3986.850	32.91	-6.06	54.0	-21.09	AV	180.80	100	Horizontal	Pass

A.2 Conducted disturbance voltage at mains terminals Test

Test Data and Plots

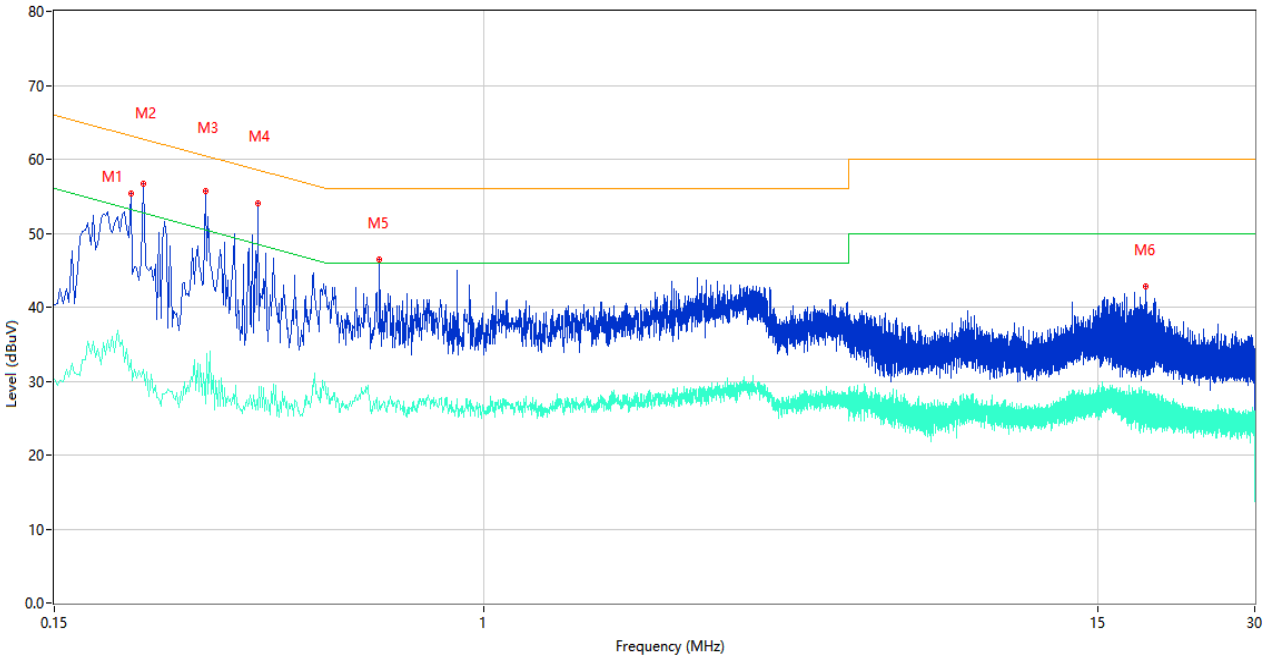
The Working Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.186	53.51	10.97	64.21	-10.70	Peak	L	Pass
1**	0.186	34.81	10.97	54.21	-19.40	AV	L	Pass
2	0.282	46.57	10.89	60.76	-14.19	Peak	L	Pass
2**	0.282	32.52	10.89	50.76	-18.24	AV	L	Pass
3	0.588	42.55	10.88	56.00	-13.45	Peak	L	Pass
3**	0.588	30.21	10.88	46.00	-15.79	AV	L	Pass
4	3.238	47.04	10.70	56.00	-8.96	Peak	L	Pass
4**	3.238	33.27	10.70	46.00	-12.73	AV	L	Pass
5	6.282	44.25	10.71	60.00	-15.75	Peak	L	Pass
5**	6.282	30.62	10.71	50.00	-19.38	AV	L	Pass
6	8.280	45.48	10.66	60.00	-14.52	Peak	L	Pass
6**	8.280	30.66	10.66	50.00	-19.34	AV	L	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.210	55.39	10.95	63.21	-7.82	Peak	N	Pass
1**	0.210	32.82	10.95	53.21	-20.39	AV	N	Pass
2	0.222	56.67	10.94	62.74	-6.07	Peak	N	Pass
2**	0.222	31.51	10.94	52.74	-21.23	AV	N	Pass
3	0.292	55.68	10.89	60.47	-4.79	Peak	N	Pass
3**	0.292	26.94	10.89	50.47	-23.53	AV	N	Pass
4	0.368	53.98	10.89	58.55	-4.57	Peak	N	Pass
4**	0.368	26.19	10.89	48.55	-22.36	AV	N	Pass
5	0.630	46.38	10.86	56.00	-9.62	Peak	N	Pass
5**	0.630	27.26	10.86	46.00	-18.74	AV	N	Pass
6	18.530	42.75	10.69	60.00	-17.25	Peak	N	Pass
6**	18.530	28.67	10.69	50.00	-21.33	AV	N	Pass

A.3 Conducted disturbance for asymmetric mode

Note: Not applicable.

A.4 Conducted differential voltage emission

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ21C0869-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ21C0869-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ21C0869-AI.PDF”.

--END OF REPORT--